

Self-Sensing Thermal Management System Using Multifunctional Nano-Enhanced Structures

Completed Technology Project (2013 - 2015)



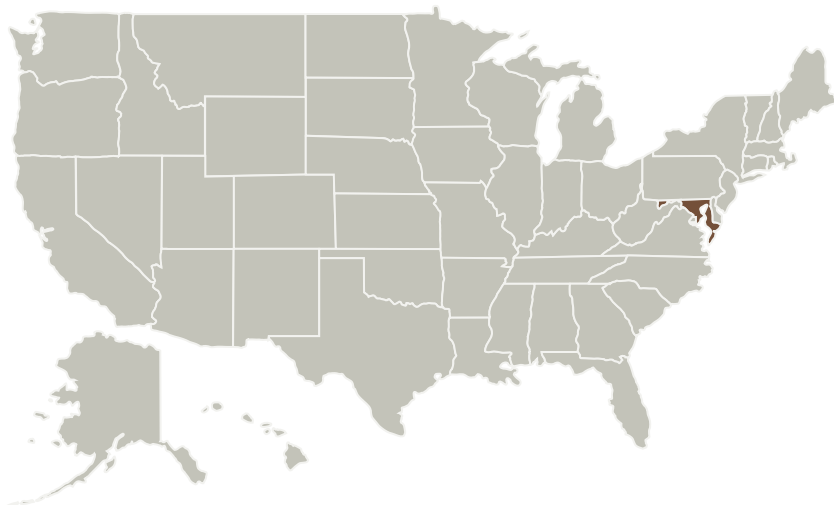
Project Introduction

The goal of this project is to develop a thermal management system with self-sensing capabilities using new multifunctional nano-enhanced structures. Currently, thermal management systems on sounding rockets or satellite walls, such as a base plate, are dependent on conventional thermocouples that are physically inserted into the plates. The basic idea of this project is to use temperature-dependent nano-enhanced polymers compatible with base plate materials to detect relative temperatures or changes in temperature via resistance changes. Thus, it will be possible for the first time to create thermal management systems with nervous systems similar to biological organisms in order to control their operation. This nervous system will be designed using a grid, of any desirable size, that will be placed on the substrate, or base plate material. Electrical leads can be connected to each node of the grid to enable measurement of resistance between any two nodes. This will allow the thermal management system to have the ability to map temperature fields of the plate in real time and use new components, such as EHD pumps.

Anticipated Benefits

The basic idea of this project is to use temperature-dependent nano-enhanced polymers compatible with base plate materials to detect relative temperatures or changes in temperature via resistance changes. Thus, it will be possible for the first time to create thermal management systems with nervous systems similar to biological organisms in order to control their operation.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Space Technology Research Grants

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Organizations Performing Work	Role	Type	Location
University of Maryland-College Park(UMCP)	Supporting Organization	Academia	College Park, Maryland

Primary U.S. Work Locations
Maryland

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Hugh Bruck

Co-Investigators:

Elizabeth A Sauerbrunn

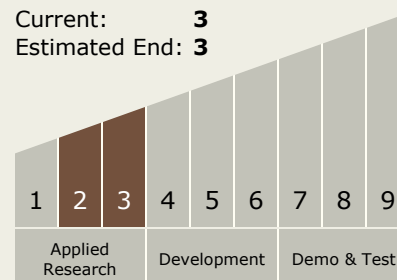
Liz Sauerbrunn

Technology Maturity (TRL)

Start: 2

Current: 3

Estimated End: 3



Technology Areas

Primary:

- TX14 Thermal Management Systems
 - TX14.2 Thermal Control Components and Systems
 - TX14.2.3 Heat Rejection and Storage